

High Accuracy Vector Helium Magnetometer (HAVHM)

Completed Technology Project (2014 - 2017)



Project Introduction

The proposed HAVHM instrument is a laser-pumped helium magnetometer with both triaxial vector and omnidirectional scalar measurement capabilities in a single package. The HAVHM project will complete the recent prototype development sponsored by NASA. The HAVHM design goals include CubeSat size and mass in order to make the instrument suitable for emerging Earth Science investigations. A major HAVHM design goal is vector accuracy improved over that of fluxgate magnetometers. The HAVHM instrument is intended for future Earth Science investigations under the Earth Science objective in the NASA SMD 2010 Science Plan to characterize and understand Earth surface changes and variability of Earth's gravitational and magnetic fields. The HAVHM instrument can be used for investigations of the Earth's surface and interior, space weather, and Earth hazards such as volcanoes and earthquakes. The HAVHM will also be applicable to Heliophysics and Planetary science investigations. Seven tasks have been identified for the successful completion of the HAVHM project. The high accuracy requirements for the full Earth field range and design goals for the HAVHM engineering model will be refined and specified in cooperation with NASA. An existing vector helium magnetometer prototype will be rigorously evaluated and calibrated to identify design components that require improvement in order to achieve the HAVHM performance goals. Design trade studies will be conducted to determine the optimum design. A comprehensive design for the HAVHM engineering model will be developed. The HAVHM sensor and electronics will be fabricated and assembled. Initial testing and evaluation will be conducted primarily at Polatomic facilities. Incremental design evaluation and final demonstration and calibration will be performed at the GSFC Spacecraft Magnetic Test Facility. The proposed HAVHM project is a three year effort. The entry TRL is estimated to be TRL4. The goal for the final TRL is TRL6.

- Design, fabricate, and calibrate a compact High Accuracy Vector Helium Magnetometer (HAVHM) for Earth Science applications.
- Reduce size, mass, and power by using CubeSat dimensions as a design goal.
- Provide vector and scalar measurements from a single instrument.
- Utilize scalar measurements to self-calibrate the vector component measurements.
- Achieve superior calibrated vector accuracy (± 1 nT per axis) not possible with fluxgate magnetometers.



ALHAT - ETD Autonomous
Landing & Hazard Avoidance
Tech Earth Science Technology
Office

Table of Contents

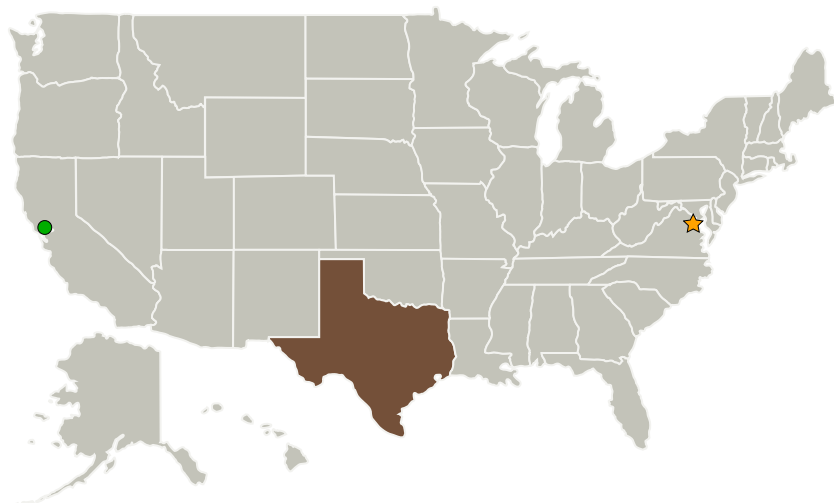
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destination	3

High Accuracy Vector Helium Magnetometer (HAVHM)

Completed Technology Project (2014 - 2017)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Polatomic, Inc.	Supporting Organization	Industry	Richardson, Texas

Primary U.S. Work Locations

Texas

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Earth Science

Project Management

Program Director:

George J Komar

Principal Investigator:

Andy W Brown

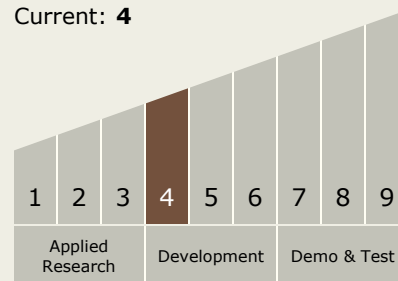
Co-Investigator:

Jean H Isham

Technology Maturity (TRL)

Start: 4

Current: 4



High Accuracy Vector Helium Magnetometer (HAVHM)

Completed Technology Project (2014 - 2017)



Images



91-1373479894122.png

ALHAT - ETD Autonomous Landing
& Hazard Avoidance Tech Earth
Science Technology Office
(<https://techport.nasa.gov/image/5128>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.1 Field and Particle Detectors

Target Destination

Earth